WHAT IS CLAIMED IS:

1   1.   A method of managing network communication comprising:

2   terminating a first transmission control protocol ("TCP") connection at a first

3   network element, wherein said first TCP connection is between said

4   first network element and a second network element, and said first

5   TCP connection is intended to be terminated at a third network

6   element;

7   initiating a second TCP connection between said first network element and a

8   third network element;

9   establishing communications between said second and said third network

10   elements via said first network element;

11   determining need for data transfer between said second and said third network

12   elements by monitoring a plurality of data buffers; and

13   transferring said data between said second and said third network elements.

1   2.   The method of claim 1, wherein said second network element initiates

2   said first TCP connection for said third network element.

1   3.   The method of claim 1, wherein said communications between said

2   second and said third network elements are established using said first and said

3   second TCP connections.

1   4.   The method of claim 1, wherein said communications between said

2   second and said third network elements forms an end-to-end TCP connection.

1   5.   The method of claim 1, wherein said first network element is a proxy

2   server.

1   6.   The method of claim 1, wherein a control unit of said proxy server

2   monitors said plurality of buffers.

1   7.   The method of claim 1, wherein said control unit transfers said data

2   between said second and said third network elements.

1   8.   The method of claim 1, wherein said proxy server supports transparent

2   communications between said second and said third network elements.

1   9.   The method of claim 1, wherein at least one of said plurality of buffers

2   is a receive buffer.

1   10.   The method of claim 1, wherein at least one of said plurality of buffers

2   is a transmit buffer.

1   11.   The method of claim 10, wherein said receive buffer is pre-allocated.

1   12.   The method of claim 10, wherein said receive buffer is dynamically

2   allocated.

1   13.   The method of claim 10, wherein said transmit buffer is pre-allocated.

1   14.   The method of claim 10, wherein said transmit buffer is dynamically

2   allocated.

1   15.   The method of claim 1, wherein said second network element is one of

2   a plurality of clients.

1   16.   The method of claim 1, wherein one of a plurality of applications on

2   said client initiates said first TCP connection for said client.

1   17.   The method of claim 1, wherein said third network element is one of a

2   plurality of servers.

1   18.   The method of claim 1, wherein a data switching unit of said proxy

2   server determines which one of said plurality of servers to use for said second TCP

3   connection.

1   19.   The method of claim 1, further comprising:

2   monitoring said first TCP connection.

1   20.   The method of claim 19, further comprising:

2   receiving a request for data from said application; and

3   determining whether said request requires said second TCP connection with

4   one of said plurality of servers.

1   21.   The method of claim 20, wherein data switching unit receives said

2   request for data via said control unit.

1   22.   The method of claim 20, wherein said determining of said second TCP

2   connection is done by said data switching unit.

1   23.   The method of claim 20, further comprising:

2   if said request does not require said second TCP connection with one of said

3   plurality of servers,

4   servicing said request for data, and

5   closing said connection with said client.

1   24.   The method of claim 23, wherein said request for data is served by

2   passing data from said data switching unit to said control unit for transmission to said

3   application on said client.

1   25.   The method of claim 23, further comprising:

2   if said request requires said second TCP connection with one of said plurality

3   of servers,

4   selecting a first server from said plurality of servers, and

5   initiating said second TCP connection with said first server.

1   26.   The method of claim 25, wherein said application requests said end-to-

2   end TCP connection with said first server.

1   27.   The method of claim 25, further comprising:

2   receiving said data on said second TCP connection from said first server;

3   storing said data in said receive buffer of said second TCP connection;

4   transferring said data from said receive buffer to said transmit buffer of said

5   first TCP connection;

6   monitoring space in said transmit buffer; and

7   if said transmit buffer has space,

8   determining whether said fist TCP connection need additional data.

1   28.   The method of claim 27, further comprising:

2   if said first TCP connection need said additional data,

3   requesting said additional data from said first server; and

4   repeating said steps of receiving, storing, transferring, monitoring and

5   determining until said request for data from said application is

6   served.

1   29.   The method of claim 28, wherein said additional data is transferred

2   into said transmit buffer without a request for said additional data.

1   30.   The method of claim 28, further comprising:

2   if said request for data from said application is served,

3   closing said first TCP connection with said client.

1   31.   The method of claim 30, wherein said closing of said connection is

2   done by said control unit upon a receiving a request for closing said connection from

3   said data switching unit.

1   32.   A network device comprising:

2   terminate a first transmission control protocol ("TCP") connection at a first

3   network element, wherein said first TCP connection is between said

4   first network element and a second network element, and said first

5   TCP connection is intended to be terminated at a third network

6   element;

7   initiate a second TCP connection between said first network element and a

8   third network element;

9   establish communications between said second and said third network

10   elements via said first network element;

11   determine need for data transfer between said second and said third network

12   elements by monitoring a plurality of data buffers; and

13   transfer said data between said second and said third network elements.

1   33.   The network device of claim 32, wherein said second network element

2 initiates said first TCP connection for said third network element.

1   34.   The network device of claim 32, wherein said communications

2 between said second and said third network elements are established using said first

3 and said second TCP connections.

1   35.   The network device of claim 32, wherein said communications

2 between said second and said third network elements forms an end-to-end TCP

3 connection.

1   36.   The network device of claim 32, wherein said first network element is

2 a proxy server.

1   37.   The network device of claim 32, wherein a control unit of said proxy

2 server monitors said plurality of buffers.

1   38.   The network device of claim 32, wherein said control unit transfers

2 said data between said second and said third network elements.

1   39.   The network device of claim 32, wherein said proxy server supports

2 transparent communications between said second and said third network elements.

1   40.   The network device of claim 32, wherein at least one of said plurality

2 of buffers is a receive buffer.

1   41.   The network device of claim 32, wherein at least one of said plurality

2   of buffers is a transmit buffer.

1   42.   The network device of claim 41, wherein said receive buffer is pre-

2   allocated.

1   43.   The network device of claim 41, wherein said receive buffer is

2   dynamically allocated.

1   44.   The network device of claim 41, wherein said transmit buffer is pre-

2   allocated.

1   45.   The network device of claim 41, wherein said transmit buffer is

2   dynamically allocated.

1   46.   The network device of claim 32, wherein said second network element

2   is one of a plurality of clients.

1   47.   The network device of claim 32, wherein one of a plurality of

2   applications on said client initiates said first TCP connection for said client.

1   48.   The network device of claim 32, wherein said third network element is

2   one of a plurality of servers.

1   49.   The network device of claim 32, wherein a data switching unit of said

2   proxy server determines which one of said plurality of servers to use for said second

3   TCP connection.

1   50.   The network device of claim 32, wherein said processor is further

2   configured to

3   monitor said first TCP connection.

1   51.   The network device of claim 50, wherein said processor is further

2 configured to

3   receive a request for data from said application; and

4   determine whether said request requires said second TCP connection with one

5   of said plurality of servers.

1   52.   The network device of claim 51, wherein data switching unit receives

2 said request for data via said control unit.

1   53.   The network device of claim 51, wherein said determining of said

2 second TCP connection is done by said data switching unit.

1   54.   The network device of claim 51, wherein said processor is further

2 configured to

3   if said request does not require said second TCP connection with one of said

4   plurality of servers,

5   service said request for data, and

6   close said connection with said client.

1   55.   The network device of claim 54, wherein said request for data is served

2 by passing data from said data switching unit to said control unit for transmission to

3 said application on said client.

1   56.   The network device of claim 54, wherein said processor is further

2 configured to

3   if said request requires said second TCP connection with one of said plurality

4   of servers,

5   select a first server from said plurality of servers, and

6   initiate said second TCP connection with said first server.

1   57.   The network device of claim 56, wherein said application requests said

2 end-to-end TCP connection with said first server.

1   58.   The network device of claim 56, wherein said processor is further

2 configured to

3   receive said data on said second TCP connection from said first server;

4   store said data in said receive buffer of said second TCP connection;

5   transfer said data from said receive buffer to said transmit buffer of said first

6   TCP connection;

7   monitor space in said transmit buffer; and

8   if said transmit buffer has space,

9   determine whether said fist TCP connection need additional data.

1   59.   The network device of claim 58, wherein said processor is further

2 configured to

3   if said first TCP connection need said additional data,

4   request said additional data from said first server; and

5   repeat said steps of receiving, storing, transferring, monitoring and

6   determining until said request for data from said application is

7   served.

1   60.   The network device of claim 59, wherein said additional data is

2 transferred into said transmit buffer without a request for said additional data.

1   61.   The network device of claim 59, wherein said processor is further

2 configured to

3   if said request for data from said application is served,

4   close said first TCP connection with said client.

1   62.   The network device of claim 61, wherein said closing of said

2 connection is done by said control unit upon a receiving a request for closing said

3 connection from said data switching unit.

1 63. A network device comprising:

2 means for terminating a first transmission control protocol ("TCP")

3   connection at a first network element, wherein said first TCP

4   connection is between said first network element and a second network

5   element, and said first TCP connection is intended to be terminated at a

6   third network element;

7 means for initiating a second TCP connection between said first network

8   element and a third network element;

9 means for establishing communications between said second and said third

10   network elements via said first network element;

11 means for determining need for data transfer between said second and said

12   third network elements by monitoring a plurality of data buffers; and

13 means for transferring said data between said second and said third network

14   elements.

1 64. The network device of claim 63, wherein said second network element

2 initiates said first TCP connection for said third network element.

1 65. The network device of claim 63, wherein said communications

2 between said second and said third network elements are established using said first

3 and said second TCP connections.

1 66. The network device of claim 63, wherein said communications

2 between said second and said third network elements forms an end-to-end TCP

3 connection.

1 67. The network device of claim 63, wherein said first network element is

2 a proxy server.

1 68. The network device of claim 63, wherein a control unit of said proxy

2 server monitors said plurality of buffers.

1   69.   The network device of claim 63, wherein said control unit transfers

2 said data between said second and said third network elements.

1   70.   The network device of claim 63, wherein said proxy server supports

2 transparent communications between said second and said third network elements.

1   71.   The network device of claim 63, wherein at least one of said plurality

2 of buffers is a receive buffer.

1   72.   The network device of claim 1, wherein at least one of said plurality of

2 buffers is a transmit buffer.

1   73.   The network device of claim 72, wherein said receive buffer is pre-

2 allocated.

1   74.   The network device of claim 72, wherein said receive buffer is

2 dynamically allocated.

1   75.   The network device of claim 72, wherein said transmit buffer is pre-

2 allocated.

1   76.   The network device of claim 72, wherein said transmit buffer is

2 dynamically allocated.

1   77.   The network device of claim 1, wherein said second network element

2 is one of a plurality of clients.

1   78.   The network device of claim 1, wherein one of a plurality of

2 applications on said client initiates said first TCP connection for said client.

1   79.   The network device of claim 1, wherein said third network element is

2 one of a plurality of servers.

1   80.   The network device of claim 1, wherein a data switching unit of said

2   proxy server determines which one of said plurality of servers to use for said second

3   TCP connection.

1   81.   The network device of claim 1, further comprising:

2   means for monitoring said first TCP connection.

1   82.   The network device of claim 81, further comprising:

2   means for receiving a request for data from said application; and

3   means for determining whether said request requires said second TCP

4   connection with one of said plurality of servers.

1   83.   The network device of claim 82, wherein data switching unit receives

2   said request for data via said control unit.

1   84.   The network device of claim 82, wherein said determining of said

2   second TCP connection is done by said data switching unit.

1   85.   The network device of claim 82, further comprising:

2   means for servicing said request for data if said request does not require said

3   second TCP connection with one of said plurality of servers; and

4   means for closing said connection with said client if said request does not

5   require said second TCP connection with one of said plurality of

6   servers.

1   86.   The network device of claim 85, wherein said request for data is served

2   by passing data from said data switching unit to said control unit for transmission to

3   said application on said client.

1   87.   The network device of claim 85, further comprising:

2   means for selecting a first server from said plurality of servers if said request

3   requires said second TCP connection with one of said plurality of

4   servers; and

5   means for initiating said second TCP connection with said first server if said

6   request requires said second TCP connection with one of said plurality

7   of servers.

1   88.   The network device of claim 87, wherein said application requests said

2   end-to-end TCP connection with said first server.

1   89.   The network device of claim 87, further comprising:

2   means for receiving said data on said second TCP connection from said first

3   server;

4   means for storing said data in said receive buffer of said second TCP

5   connection;

6   means for transferring said data from said receive buffer to said transmit

7   buffer of said first TCP connection;

8   means for monitoring space in said transmit buffer; and

9   means for determining whether said fist TCP connection need additional data

10   if said transmit buffer has space.

1   90.   The network device of claim 89, further comprising:

2   means for requesting said additional data from said first server if said first

3   TCP connection need said additional data;

4   means for repeating said steps of receiving, storing, transferring, monitoring if

5   said first TCP connection need said additional data; and

6   means for determining until said request for data from said application is

7   served.

1   91.   The network device of claim 90, wherein said additional data is

2   transferred into said transmit buffer without a request for said additional data.

1　　92.　　The network device of claim 90, further comprising:

2　　　　　means for closing said first TCP connection with said client if said request for

3　　　　　　　data from said application is served.

1　　93.　　The network device of claim 92, wherein said closing of said

2　connection is done by said control unit upon a receiving a request for closing said

3　connection from said data switching unit.

1　　94.　　A computer program product for managing network communication,

2　encoded in computer readable media, said program product comprising a set of

3　instructions executable on a computer system, said set of instructions configured to

4　　　　　terminate a first transmission control protocol ("TCP") connection at a first

5　　　　　　　network element, wherein said first TCP connection is between said

6　　　　　　　first network element and a second network element, and said first

7　　　　　　　TCP connection is intended to be terminated at a third network

8　　　　　　　element;

9　　　　initiate a second TCP connection between said first network element and a

10　　　　　　third network element;

11　　　　establish communications between said second and said third network

12　　　　　　elements via said first network element;

13　　　　determine need for data transfer between said second and said third network

14　　　　　　elements by monitoring a plurality of data buffers; and

15　　　　transfer said data between said second and said third network elements.

1　　95.　　The computer program product of claim 94, wherein said second

2　network element initiates said first TCP connection for said third network element.

1　　96.　　The computer program product of claim 94, wherein said

2　communications between said second and said third network elements are established

3　using said first and said second TCP connections.

1   97.   The computer program product of claim 94, wherein said
2 communications between said second and said third network elements forms an end-
3 to-end TCP connection.

1   98.   The computer program product of claim 94, wherein said first network
2 element is a proxy server.

1   99.   The computer program product of claim 94, wherein a control unit of
2 said proxy server monitors said plurality of buffers.

1   .   100.   The computer program product of claim 94, wherein said control unit
2 transfers said data between said second and said third network elements.

1   101.   The computer program product of claim 94, wherein said proxy server
2 supports transparent communications between said second and said third network
3 elements.

1   102.   The computer program product of claim 94, wherein at least one of
2 said plurality of buffers is a receive buffer.

1   103.   The computer program product of claim 94, wherein at least one of
2 said plurality of buffers is a transmit buffer.

1   104.   The computer program product of claim 102, wherein said receive
2 buffer is pre-allocated.

1   105.   The computer program product of claim 102, wherein said receive
2 buffer is dynamically allocated.

1   106.   The computer program product of claim 103, wherein said transmit
2 buffer is pre-allocated.

1   107.   The computer program product of claim 103, wherein said transmit
2 buffer is dynamically allocated.

1   108. The computer program product of claim 94, wherein said second

2 network element is one of a plurality of clients.

1   109. The computer program product of claim 94, wherein one of a plurality

2 of applications on said client initiates said first TCP connection for said client.

1   110. The computer program product of claim 94, wherein said third network

2 element is one of a plurality of servers.

1   111. The computer program product of claim 94, wherein a data switching

2 unit of said proxy server determines which one of said plurality of servers to use for

3 said second TCP connection.

1   112. The computer program product of claim 94, wherein said set of

2 instructions is further configured to :

3   monitor said first TCP connection.

1   113. The computer program product of claim 112, wherein said set of

2 instructions is further configured to :

3   receive a request for data from said application; and

4   determine whether said request requires said second TCP connection with one

5   of said plurality of servers.

1   114. The computer program product of claim 113, wherein data switching

2 unit receives said request for data via said control unit.

1   115. The computer program product of claim 113, wherein said determining

2 of said second TCP connection is done by said data switching unit.

1   116.   The computer program product of claim 82, wherein said set of

2   instructions is further configured to :

3   if said request does not require said second TCP connection with one of said

4   plurality of servers,

5   service said request for data, and

6   close said connection with said client.

1   117.   The computer program product of claim 116, wherein said request for

2   data is served by passing data from said data switching unit to said control unit for

3   transmission to said application on said client.

1   118.   The computer program product of claim 116, wherein said set of

2   instructions is further configured to :

3   if said request requires said second TCP connection with one of said plurality

4   of servers,

5   select a first server from said plurality of servers, and

6   initiate said second TCP connection with said first server.

1   119.   The computer program product of claim 118, wherein said application

2   requests said end-to-end TCP connection with said first server.

1   120.   The computer program product of claim 118, wherein said set of

2   instructions is further configured to :

3   receive said data on said second TCP connection from said first server;

4   store said data in said receive buffer of said second TCP connection;

5   transfer said data from said receive buffer to said transmit buffer of said first

6   TCP connection;

7   monitor space in said transmit buffer; and

8   if said transmit buffer has space,

9   determine whether said fist TCP connection need additional data.

1   121.   The computer program product of claim 120, wherein said set of

2   instructions is further configured to :

3   if said first TCP connection need said additional data,

4   request said additional data from said first server; and

5   repeat said steps of receiving, storing, transferring, monitoring and

6   determining until said request for data from said application is

7   served.

1   122.   The computer program product of claim 121, wherein said additional

2   data is transferred into said transmit buffer without a request for said additional data.

1   123.   The computer program product of claim 121, wherein said set of

2   instructions is further configured to :

3   if said request for data from said application is served,

4   close said first TCP connection with said client.

1   124.   The computer program product of claim 123, wherein said closing of

2   said connection is done by said control unit upon a receiving a request for closing said

3   connection from said data switching unit.